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Abstract

SOME JAPANESE WORKS ON CHEMICAL SEPARATION OF URANIUM ISOTOPES

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Part I. A Theory of Uranium Isotope Separation involving Electron Exchange Reaction

The theoretical studies have proved that the mixture of U(IV) and U(VI) should be a favorable system, if the electron exchange reaction between the isotopes could be catalysed.

Part II. Ion Exchange Resin as an Effective Catalyzer to the Electron Exchange Reaction Between U(IV) and U(VI)

Cation and anion exchange resins were ascertained as very promising catalyzers. For example:

$$\frac{\text{rate of electron exchange in cation exchange resin}}{\text{rate of electron exchange in solution}} = 10^3 - 10^4$$

Part III. Chemical Separation of Uranium Isotope with Ion Exchanger in the System containing both U(IV) and U(VI)

Better separation factors were observed for U(IV) (1.0007) than U(VI) (1.0000). Much higher separation factors (1.0014) were obtained for the mixed systems of U(IV) and U(VI), which could be explained by the effective contribution of the isotopic effect in electron exchange reaction between U(IV) and U(VI).

Part IV. Uranium Isotope Fractionation in Ion Exchange Membrane by Ionic Migration

At the front of U-band in ion exchange membrane an appreciable enrichment of 235-U was observed just as in the case of Li isotcpe.

Part V. Effect of Superposing A.C. on Isotope Separation in Ion Exchange Resin Column by Ionic Migration

By superposing A.C. similar favorable effects to N isotopes were observed on U isotope fractionation.

Part VI. A New Continuous Isotopes Separation Apparatus Based on a Simultaneous Use of Ion Exchange Elution and Ionic Migration

An apparatus based on the idea of combining two processes, ion exchange elution and ionic migration, was devised to aim the synergetic effect of them as well as the continuous operation. Through this apparatus the continuous flow of enriched 6-Li (e.g. 7-Li/6-Li = 11.61) was obtained at the cathode side, while the depleted 6-Li (e.g. 12.81) at the anode side. Similarly the enrichment of 235-U was observed in the flow of the cathode side.